



SERICULTURE EXPANSION PLANNING GETS SPACE APPLICATIONS SUPPORT



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Indian sericulture - a 7.5 million employed, agro based, livelihood activity- is fast expanding to new areas by the active support of the Government wherein newer technologies are introduced with fore-thoughtness. Being the second largest producer of silk in the world, producing 23060 M.T of silk annually, the country is blessed with vast natural and human resources and well appreciated for applying latest technologies for promoting sericulture. Central Silk Board (CSB) has applied an array of new technologies for promotion of sericulture development in the country during five year plans implementation with the pro-active support and participation of state sericulture departments. Usage of modern agricultural techniques, biotechnological tools and textile development advancements, sericulture has seen a healthy growth percentage above 5% on an average in its five decade of planned approach.

With an ambitious target set to generate direct and indirect employment to the tune of 9.24 million persons by the terminal year of XII Plan, strategy is now to expand sericulture area to newer locations, there is an urgent necessity for identifying new areas with potential for expanding plantation. In mulberry sector alone, the need of XII plan is to increase the plantation from 1.81 lakh hectares to 2.40 lakh hectares- a target to bring additional 59,331 ha (1,48,328 acres) of Mulberry plantation. Similarly there is tremendous scope for expansion of areas under in Vanya sector too. Conventional process of selecting the potential area in newer locations needs extensive ground work, human resources and thus a costly affair. Without cutting in to the core agriculture practicing cultivable areas, Remote Sensing (RS) and Geographic Information System (GIS) techniques could effectively be used in identifying few pockets with higher potential so that focus can be made to the specific areas for expansion of sericulture activities.

Application of (RS) and (GIS) technologies for sericulture expansion is one among the few areas where India has taken a giant step. Since 1994, CSB and Indian Space Research Organisation (ISRO) have made a number of studies such as standardising techniques for identification of mulberry areas, assessing mulberry plantation & biomass. Identification of potential areas

at 1:2,50,000 scale was done on a pilot basis through a joint Project 'SPAARS' (Survey of Potential and Actual Areas with Remote Sensing). The findings and accuracy in interpreting the RS and GIS information in sericulture sector gave further thought of implementing a full fledged project. In the XI Plan Period, CSB took a giant step in RS & GIS application in sericulture with the objective to utilise cultivable wastelands for sericulture and identify potential areas in 108 districts (41 districts in NER) spread over to 24 states. North Eastern Space Applications Centre, Dept of Space was entrusted to implement the project in collaboration with State Remote Sensing Centres and other partner Institutes. These project districts were selected in consultation with the respective State Sericulture Departments. An effort was also made in identifying VANYA food plant potential areas by RS & GIS techniques for the first time in the country.

With the primary objective of identification of additional potential areas for development of silkworm food plants in three phases, CSB has extended the R & D requirements in fine tuning the project methodology to NESAC. The project also had an objective of developing a PCT based web portal for each district to disseminate the findings of potential area coupled with useful information titled as SILKS –Sericulture Information Linkages and Knowledge System for the benefit of all stakeholders especially the farmers. The English version of SILKS now shall be translated to farmer useful local languages in stages. The Portal got further utility by linking to weather forecasts from District Agro-met Advisory of IMD on pilot basis now, which shall be fully operational in coming few months. Further, the Project also made an attempt on appraisal survey in selected Talukas for assessing sericulture status and changes using high resolution satellite images for future applications.

The identification of potential areas for sericulture development involves evaluation of land and water resources requirements for growing silkworm food plants as well as rearing of silk worms. The assessment of suitability of land for sericulture involves matching the land qualities with the requirements of the silkworm food plants and silkworm rearing. It required interpretation and integration of soils, climatic parameters, vegetation

and other aspects of land, like wastelands and slope using GIS. The areas under cultivatable wastelands have been evaluated for introducing sericulture in the new areas. The evaluation procedure consists of three phases viz, evaluation of site suitability based on landscape and soil characteristics, evaluation based on climatic parameters for silkworm food plants and evaluation of suitability for silkworm rearing. Soil characteristics such as slope, soil depth, pH, texture, ground water **availability are** integrated while assessing the soil site suitability.

Similarly, the climate suitability has been analysed for a particular crop in terms of: (i) minimal length of growing period, (ii) temperature and (iii) water supply (rainfall). The weather data, collected from the class-I observatories of IMD and the automatic weather stations (AWS) established by ISRO have been analysed for rainfall, maximum and minimum temperature, Potential Evapotranspiration (PET) and length of growing period (LGP) for the silkworm food plants.

Silkworms are delicate and very sensitive to environmental conditions. Among the various environmental factors, the most important are atmospheric temperature and humidity prevailing at the time of rearing. Temperature has indirect correlation to the growth of the silkworms and excessive fluctuations in temperature are harmful and should be avoided. The combined effect of both temperature and humidity largely determines the satisfactory growth of the silkworms. The growth of the worm is better under higher temperature and higher humidity condition followed by lower temperature and lower humidity condition during their life cycle. Humidity also influences directly the physiological functions of the silkworm. The optimum temperature and humidity for normal growth in mulberry silkworm is between 23 -28°C and 70-85% respectively. Spatial layers on the temperature and humidity suitability were generated using an interpolation technique with geostatistical analyst tool (Arc GIS software).

POTENTIAL AREA MAPS AND STATISTICS

I. NORTH EASTERN STATES

I. 1. MULBERRY

Summary statistics of potential areas identified by the exercise for Mulberry in North eastern states is given below:

| States | No. of selected districts | Total Geographical area (Ha) of the districts | POTENTIAL AREA | | | |
|-------------------|---------------------------|---|----------------------|--------------------------|--------------------------|---------------|
| | | | Highly suitable (Ha) | Moderately suitable (Ha) | Marginally suitable (Ha) | Total (Ha) |
| Arunachal Pradesh | 7 | 3698100 | 13 | 1908 | 15321 | 17242 |
| Assam | 9 | 3271300 | 1169 | 76893 | 232377 | 310439 |
| Manipur | 9 | 2232700 | 4164 | 5930 | 44543 | 54637 |
| Meghalaya | 2 | 505100 | 13928 | 32381 | 33425 | 79733 |
| Mizoram | 6 | 1827800 | 85598 | 73495 | 17567 | 176660 |
| Nagaland | 5 | 1091000 | 5160 | 18108 | 41800 | 65068 |
| Sikkim | 1 | 75000 | 0 | 827 | 5095 | 5922 |
| Tripura | 2 | 442300 | 219 | 17388 | 14745 | 32352 |
| Total | 41 | 93519500 | 100926 | 202889 | 625487 | 935196 |

As an example of potential area map with four different suitability categories viz., Highly suitable, Moderately suitable, Marginally suitable and Less suitable for Aizawl district of Mizoram is shown below:

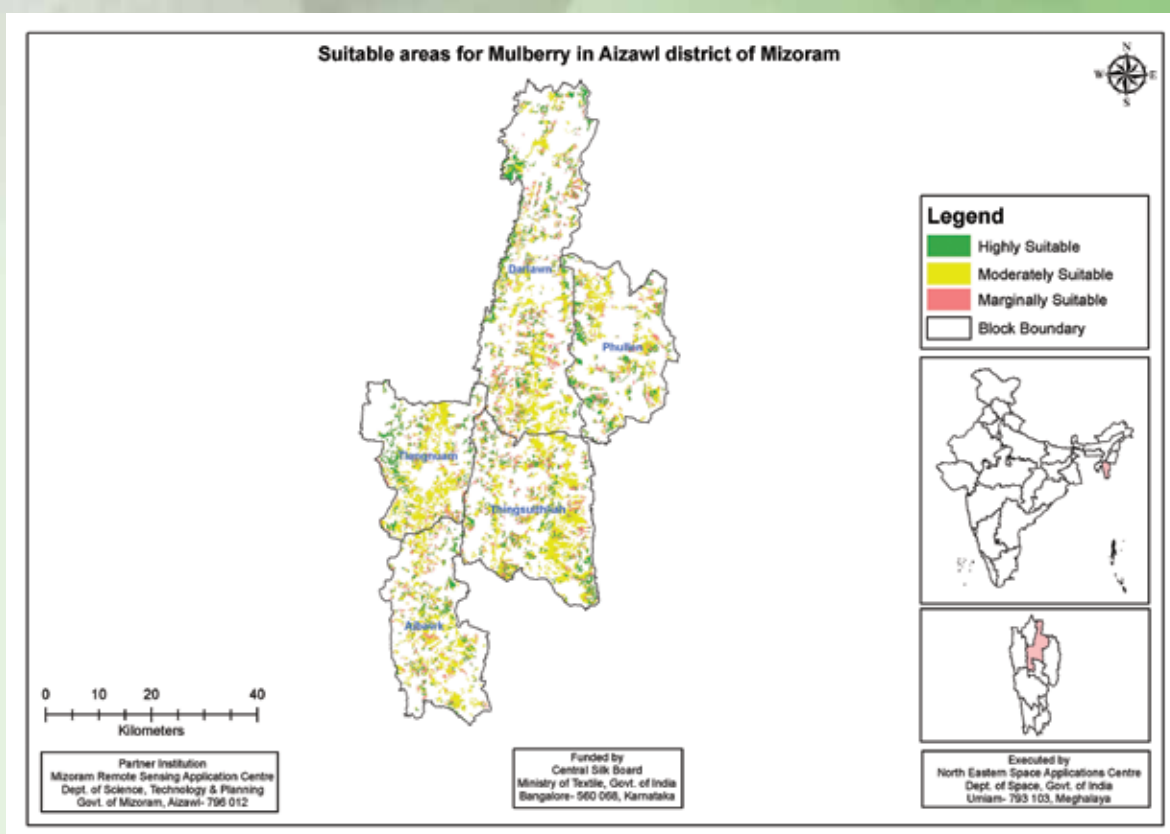


Fig. Potential area map for mulberry in Aizawl District, Mizoram

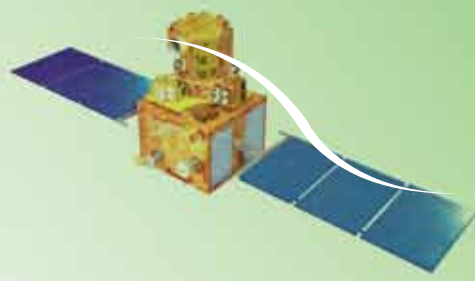
I. 2. VANYA

The potential area mapping for vanya sector i.e Muga, Eri and Oak tasar for all the 8 North Eastern states were taken up under the project:-

I. 2.1. MUGA

Table: Summary of potential area mapping in north eastern states – Muga

| States | No of selected districts | TGA (00' Ha) | POTENTIAL AREA | | | | Total (Ha) |
|-------------------|--------------------------|---------------|----------------------|--------------------------|--------------------------|--------------------|----------------|
| | | | Highly suitable (Ha) | Moderately suitable (Ha) | Marginally suitable (Ha) | Less suitable (Ha) | |
| Arunachal Pradesh | 7 | 36981 | 33622 | 41065 | 22014 | 10770 | 107472 |
| Assam | 9 | 32713 | 133786 | 193100 | 140802 | 179701 | 647390 |
| Manipur | 9 | 22327 | 7871 | 13702 | 15886 | 600531 | 637990 |
| Meghalaya | 2 | 5051 | 4745 | 10835 | 11214 | 116662 | 143456 |
| Mizoram | 6 | 18278 | 114201 | 24265 | 230406 | 0 | 346857 |
| Nagaland | 5 | 10910 | 16110 | 41908 | 37462 | 15473 | 110953 |
| Tripura | 2 | 4423 | - | - | - | 10763 | 10763 |
| Sikkim | 1 | 750 | - | - | 466 | - | 466 |
| Total | 41 | 130683 | 310335 | 324875 | 457784 | 933901 | 2004880 |



I. 2.2. ERI

Table: Summary of potential area mapping in north eastern states – ERI

| States | No of selected districts | TGA (00' Ha) | POTENTIAL AREA | | | | Total (Ha) |
|-------------------|--------------------------|---------------|----------------------|--------------------------|--------------------------|--------------------|----------------|
| | | | Highly suitable (Ha) | Moderately suitable (Ha) | Marginally suitable (Ha) | Less suitable (Ha) | |
| Arunachal Pradesh | 7 | 36981 | 28941 | 36272 | 18763 | 8674 | 92650 |
| Assam | 7 | 29710 | 122486 | 116643 | 93436 | 132858 | 465425 |
| Manipur | 9 | 22327 | 7513 | 12933 | 14668 | 550268 | 585382 |
| Meghalaya | 2 | 5051 | 4118 | 5482 | 4669 | 35258 | 49527 |
| Mizoram | 6 | 18278 | 9564 | 1115 | 61171 | 0 | 71851 |
| Nagaland | 5 | 10910 | 15463 | 38064 | 30807 | 12908 | 97243 |
| Sikkim | 1 | 750 | - | - | 65 | - | 65 |
| Total | 37 | 123257 | 188086 | 210510 | 223515 | 739717 | 1362077 |

I. 2.3 TASAR

Table: Summary of potential area mapping in north eastern states –TASAR

| States | No of selected districts | TGA (00' Ha) | POTENTIAL AREA | | | | Total (Ha) |
|-------------------|--------------------------|---------------|----------------------|--------------------------|--------------------------|--------------------|---------------|
| | | | Highly suitable (Ha) | Moderately suitable (Ha) | Marginally suitable (Ha) | Less suitable (Ha) | |
| Arunachal Pradesh | 7 | 36981 | 16115 | 17667 | 8042 | 2983 | 44808 |
| Assam | 6 | 25924 | 89823 | 39363 | 26633 | 102202 | 258021 |
| Manipur | 9 | 22327 | 7439 | 12331 | 13794 | 357002 | 390566 |
| Meghalaya | 1 | 2603 | - | - | - | 9970 | 9970 |
| Mizoram | 6 | 18278 | 6729 | 3144 | 51445 | 0 | 61317 |
| Nagaland | 5 | 10910 | 12406 | 26986 | 19747 | 6437 | 65576 |
| Total | 34 | 117023 | 132511 | 99492 | 119662 | 478594 | 830258 |

II. PHASE II OTHER THAN NORTH EASTERN STATES

With the need for expanding sericulture in other than north eastern states potential area mapping was done in 16 states for mulberry sector, two each for Muga and Tasar, and three for Eri sector., the results are presented below:-

Table: Potential areas for Muga for states other than NE states:

| STATES | No of selected districts | TGA (00' Ha) | Highly suitable (Ha) | Moderately suitable (Ha) | Marginally suitable (Ha) | Less suitable (Ha) | Total (Ha) |
|--------------|--------------------------|--------------|----------------------|--------------------------|--------------------------|--------------------|---------------|
| Uttarakhand | 4 | 22411 | - | - | - | 10384 | 10384 |
| West Bengal | 2 | 9614 | 192935 | 15121 | 99269 | 654144 | 961468 |
| Total | 6 | 32025 | 192935 | 15121 | 99269 | 664528 | 971852 |

Table: Potential areas for Muga for states other than NE states:

| STATES | No of selected districts | TGA (00' Ha) | Highly suitable (Ha) | Moderately suitable (Ha) | Marginally suitable (Ha) | Less suitable (Ha) | Total (Ha) |
|----------------|--------------------------|--------------|----------------------|--------------------------|--------------------------|--------------------|---------------|
| Andhra Pradesh | 2 | 23939 | - | - | - | 116184 | 116184 |
| Bihar | 3 | 8934 | - | - | - | 192892 | 192892 |
| West Bengal | 1 | 6227 | 71199 | 37735 | 33154 | 480736 | 622823 |
| Total | 6 | 15161 | 71199 | 37735 | 33154 | 673628 | 815715 |

Table: Potential areas for Muga for states other than NE states:

| STATES | No of selected districts | TGA (00' Ha) | Highly suitable (Ha) | Moderately suitable (Ha) | Marginally suitable (Ha) | Less suitable (Ha) | Total (Ha) |
|---------------|--------------------------|--------------|----------------------|--------------------------|--------------------------|--------------------|----------------|
| Jharkhand | 1 | 2815 | 36209 | 19887 | 0 | 0 | 56095 |
| Orissa | 4 | 25986 | 359635 | 153009 | 138758 | 0 | 651402 |
| Uttar Pradesh | 3 | 13131 | - | - | - | 137608 | 137608 |
| Uttarakhand | 4 | 22411 | 206976 | 109464 | 0 | 0 | 316439 |
| West Bengal | 4 | 27031 | 363192 | 119001 | 262990 | 1956693 | 2701876 |
| Total | 16 | 91374 | 966011 | 401361 | 401748 | 2094301 | 3863420 |

Table: Potential areas for Mulberry for 16 other than NE States

| States | No. of selected districts | Total Geographical area (Ha) of the districts | POTENTIAL AREA | | | |
|-------------------|---------------------------|---|----------------------|--------------------------|--------------------------|----------------|
| | | | Highly suitable (Ha) | Moderately suitable (Ha) | Marginally suitable (Ha) | Total (Ha) |
| Andhra Pradesh | 4 | 3751800 | 32008 | 355312 | 212627 | 599947 |
| Bihar | 3 | 893400 | 0 | 59916 | 41458 | 101374 |
| Chattisgarh | 2 | 2206000 | 0 | 3162 | 9994 | 13156 |
| Himachal Pradesh | 4 | 1560700 | 13755 | 96073 | 42254 | 152082 |
| Jammu and Kashmir | 2 | 210800 | 2551 | 6154 | 11299 | 20003 |
| Jharkhand | 3 | 874200 | 0 | 7651 | 11531 | 19182 |
| Karnataka | 4 | 3387800 | 0 | 82433 | 1659165 | 1741599 |
| Kerala | 2 | 941100 | 9914 | 21970 | 14803 | 46686 |
| Madhya Pradesh | 6 | 3513200 | 1136 | 77208 | 279563 | 357907 |
| Maharashtra | 7 | 7252000 | 0 | 6441 | 76401 | 82843 |
| Orissa | 4 | 2598600 | 238 | 7976 | 88217 | 96431 |
| Punjab | 2 | 456800 | 0 | 0 | 521 | 521 |
| Tamil Nadu | 4 | 2413300 | 95325 | 59449 | 10446 | 165220 |
| Uttar Pradesh | 6 | 2388600 | 584 | 8135 | 16382 | 25101 |
| Uttarakhand | 5 | 2499000 | 595 | 300 | 263 | 1158 |
| West Bengal | 9 | 5043800 | 38038 | 54272 | 24571 | 116882 |
| Total | 67 | 39991100 | 194144 | 846452 | 2499495 | 3540092 |

III SERICULTURE INFORMATION LINKAGES AND KNOWLEDGE SYSTEM (SILKS)

SILKS is a single window, ICT-based information and advisory services system for the farmers practicing sericulture. The objectives of SILKS are to i) provide computerized information storage, value addition, and supply sericulture knowledge to the farmers, ii) Provide planning and advisory services in formats and language appropriate for the local sericulturists, and iii) supply the information and advisory services through Internet and satellite – based communication. SILKS webportal has been hosted in the public domain as <http://silks.csb.gov.in>



Each SILKS has modules of information on the natural resources potential of a group of villages, their suitability for sericulture, agro-climatic conditions, package of best practices of sericulture, cocoon and silk marketing information, etc. The meteorological data collected by the network of Automatic Weather Stations (AWS) established all over India and a few in the R&D laboratories of CSB served as an important source of data for value added services from SILKS.

FEATURES OF SILKS

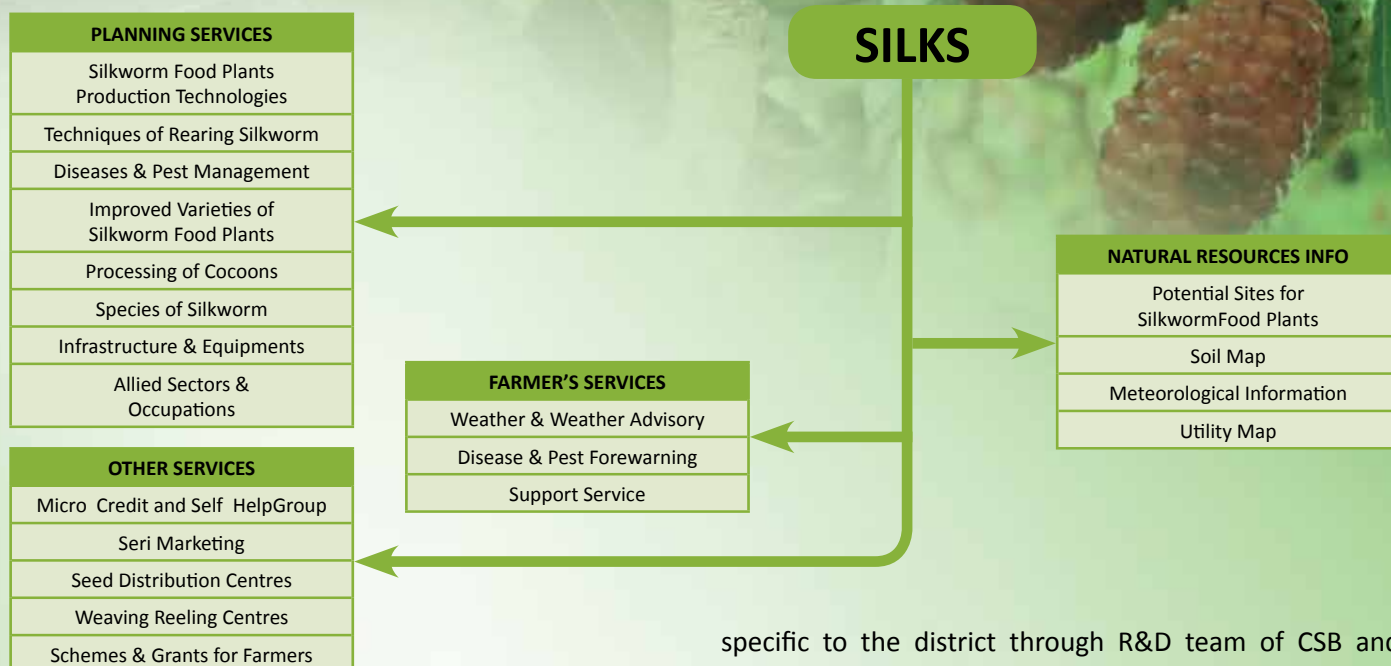
There are various navigation tools for map navigation and control such as zoom in, zoom out, zoom to full extent, selective zoom, re-center tool, pan, distance measuring and print map tools. Features on the map can be identified using Map Identify tool. Distance measuring tool of map also have been included as part of spatial map analysis tool. Results of map query or area of interest can be printed out along with detail legend using Print tool. The size, font type and map output can be customized

using this tool. The map can be produced in various file formats such as PNG, JPEG, GIF or PDF. Region specific zoom is made possible using QuickZoom tool.

INFORMATION MODULES

The SILKS has been developed for all the 108 districts covered under the project. It has 16 major non-spatial modules and 4 spatial modules, which are grouped into four categories, namely Planning Services, Other Services, and Natural Resources Management and Farmer’s Service. The available modules under Planning Services are Silkworm Food Plants Production Technologies, Techniques of Rearing Silkworm, Diseases and Pest Management of Silkworm Food Plants, Improved Varieties of Silkworm Food Plants, Species of Silkworm, Processing of Cocoons, Infrastructure and Equipments and Allied Sectors and Occupations. The Other Service has modules like Micro Credit and Self Help Group, Seri Marketing, Seed Distribution Centres, Weaving Reeling Centres and Schemes & Grants for **Farmers**

SILKS



FARMER SERVICES

An exclusive service pack for providing farmer useful information has been introduced which shall focus on day to day and timely needed information's bundled in one pack and shared in major local languages in a phased manner. Being most valuable inputs to farmers, the contents are constantly updated with relevant inputs from all concerned user departments..

WEATHER AND WEATHER ADVISORY MODULE

As weather plays a major role in the success of sericulture crops, sharing of weather forecasts in advance and providing weather forecast based sericulture advisory service will help farmers to take such precautionary steps in reducing the crop losses and minimising losses in inputs that is wasted due to weather vagaries. At present, weather bulletins are hyperlinked to district AGROMET advisory services provided by IMD, Pune on pilot basis – initially for districts of Andhra Pradesh which shall be extended to all the districts after an MOU. Sericulture farmers registering for above service will be alerted through SMSs through IMD dissemination services. It is proposed to provide exclusive sericulture advisory through a Project mode in collaboration with IMD.

DISEASE AND PEST FOREWARNING

Farmers will be shared with diseases and pests information including timely tips / warnings and advises

specific to the district through R&D team of CSB and State Research Institutes. Diseases and Pest calendar and control measures in local language will also be made available through this module.

SUPPORT SERVICE

This module is a bundle of useful information required for day to day and periodic needs of sericulturists packed in four sub-modules which includes backward and forward linkage needs such as Planting material, silkworm seed, critical inputs, marketing information, support schemes, stakeholders details, district sericulture activity progresses and so on - mainly hyperlinked to state and district specific website as also information updated from time to time by District Sericulture Officers / R&D Unit I/ Cs and linked Organization.

LIMITATIONS AND FUTURE SCOPE

There have been a number of suggestions from the user departments to integrate more parameters mainly the socio-economic status while deciding different suitability categories, but such detailed analysis is beyond the scope of the project. It expected that user departments may conduct such studies while implementing sericulture activities in the areas identified in the study. With more detailed spatial information being generated under a number of ongoing space application projects, it is expected to have more detailed information at panchayat level. In addition, participation of a large of users and sharing of farmer specific information will enrich the content of SILKS portal.

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